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A PUBLICATION OF THE

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October 2004

Maternal Obesity and Pregnancy Outcomes

In 2001, the Surgeon General declared, "Overweight and obesity have reached epidemic proportions in the United States… Left unabated they may soon cause as much preventable disease as cigarette smoking."[1] Obesity in pregnant women specifically may lead to poor pregnancy outcomes such as infant death, maternal death, gestational diabetes, labor complications, and increased risk of babies being born with birth defects.[2] The obesity rate among pregnant women in Missouri during the last 20 years has tripled from 7.1 percent in 1983 to 21.3 percent in 2003. During the last ten years alone, the rate has increased by 54 percent increasing from the 13.8 percent in 1993 to 21.3 percent in 2003. It is these issues among obese pregnant women and subsequent birth outcomes that are explored throughout this paper.

Obesity is defined as having a body mass index (BMI) greater than or equal to 30. BMI is defined as weight in kilograms divided by height in meters squared. By comparison normal weight is defined as BMI of 18.5 to 24.9, underweight less than 18.5 and overweight 25.0-29.9. Table 1 shows the tripling of the maternal obesity rate from 1983 to 2003. It also shows the proportion of pregnant mothers in the normal weight status dropped from nearly 70 percent in 1983 to barely 50 percent in 2003 according to birth certificates. The proportion overweight or obese more than doubled in the last 20 years from 20.6 percent in 1983 to 44.3 percent in 2003.

Graph 1
Percent Distribution of Pre-pregnant Weight Status: Missouri 1983-2003

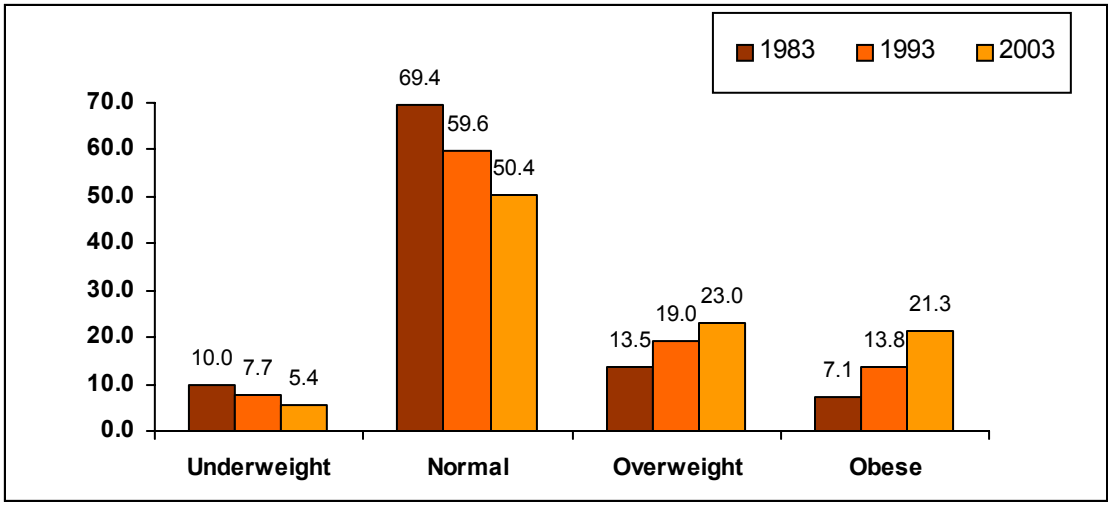

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Table 1
Percent Distribution of Pre-pregnant Weight Status:
Missouri Live Births 1983, 1993 and 2003

				Percent Change	
	1983	1993	2003	93-03	83-03
Underweight	10.0	7.7	5.4	-29.9	-46.0
Normal	69.4	59.6	50.4	-15.4	-27.4
Overweight	13.5	19.0	23.0	21.1	70.4
Obese	7.1	13.8	21.3	54.3	200.0
Total births	75,505	75,146	76,960		

Large increases in obesity have taken place in all major demographic age, race, education and birth order subgroups, as Table 2 shows. Highest obesity rates in 2003 occurred among mothers at least age 25, black mothers, mothers in the middle education groups, mothers having multiple births, and higher birth order births. The lowest obesity rates occurred among teen mothers, non-white non-black mothers, those with college degrees and those delivering first births.

Table 2
Maternal Obesity Trends by Selected Variables:
Missouri Live Births 1983,1993 and 2003

	Percent Obese			*Percent Change*	
	1983	1993	2003	93-03	83-03
Under 20	3.2	8.3	12.1	45.8	278.1
20-24	6.3	15.1	20.8	37.7	230.2
25-29	7.7	14.4	23.9	66.0	210.4
30-34	9.6	14.1	22.4	58.9	133.3
35+	12.3	15.6	23.1	48.1	87.8
White	6.7	12.9	20.5	58.9	206.0
Black	9.8	18.7	27.8	48.7	183.7
Other	2.7	5.8	11.8	103.4	337.0
Smoker	6.6	13.1	20.5	56.5	210.6
Nonsmoker	7.3	14.0	21.4	52.9	193.2
Educ <12	7.0	12.8	18.6	45.3	165.7
Educ 12	8.2	16.1	24.7	53.4	201.2
Educ 13-15	6.9	15.3	25.1	64.1	263.8
Educ 16+	4.5	8.9	16.0	79.8	255.6
Married	7.0	13.5	21.5	59.3	207.1
Unmarried	7.5	14.5	21.0	44.8	180.0
Singleton	7.1	13.7	21.2	54.7	198.6
Multiple	9.1	17.8	24.6	38.2	170.3
lst birth order	5.2	11.4	17.8	56.1	242.3
2nd-4th birth order	8.0	15.3	23.4	52.9	192.5
5th+ birth order	16.1	17.6	28.4	61.4	76.4
Total	7.1	13.8	21.3	54.3	200.0
Total live births	75,505	75,146	76,960		

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However, the largest rates of increase in obesity during the last 10 and 20 years tended to take place among these women with lower current rates.

Geographically, obesity occurred most frequently in rural areas of Southeast and Northern Missouri according to Map 1, which shows quartiles of obesity rates by county for 1999-2003 births. Counties with the highest rates were Clark County in Northeast Missouri at 29.4 percent obese, and Reynolds and Iron Counties in Southeast Missouri at 29.0 percent. Low obesity rates tended to take place in suburban areas around Kansas City and St. Louis and counties with large universities. Platte County near Kansas City had the lowest obesity rate in the state during 1999-2003 at 15.9 percent. To show the widespread increase in maternal obesity in Missouri, this 1999-2003 lowest county rate of 15.9 percent was still higher than the 1993 statewide obesity rate of 13.8. percent.

Table 3 presents percentages of some selected medical risk factors, complications of labor/delivery and obstetric procedures that are most prevalent among obese mothers for 1999-2003 Missouri resident live births. Overall, obese mothers have a medical risk factor mentioned on 39.4 percent of their infants' birth certificates compared with 26.7 percent among normal weight women. Overweight mothers fell between the two with 30.6 percent with medical risk factors. Nearly all of the elevated obesity rate was due to the more frequent occurrence of diabetes and hypertension among obese mothers. The diabetes rate was over four times higher among obese mothers than among normal weight mothers and hypertension was almost three times more frequent.

Complications of labor and delivery were also more frequent among obese mothers than overweight and normal weight mothers, (41.6 percent vs. 35.1 percent vs. 35.2 percent, respectively). The relative

Table 3
Selected Obstetric Conditions and Procedures by Pre-pregnant Weight Status of Mother: Missouri 1999-2003

	Obese %	*Overweight* %	*Normal* %	*Underweight* %
Any medical risk factor	39.4	30.6	26.7	28.8
Anemia	1.5	1.6	1.6	2.5
Diabetes	7.9	3.7	1.8	1.1
Hypertension	11.8	6.9	4.2	2.9
Hydramnios/Oligohydramnios	2.5	1.9	1.7	2.1
Any complication of labor/delivery	41.6	38.1	35.2	33.0
Meconium	6.0	5.6	4.9	4.2
Dysfunctional labor	7.0	5.4	4.1	3.0
Breech	4.4	3.8	3.8	4.0
Other malpresentation	2.5	2.3	1.9	1.6
Cephalopelvic disproportion	3.2	2.5	1.9	1.3
Fetal distress	7.5	6.6	5.9	5.8
Any obstetric procedure	97.1	96.9	97.0	96.5
Amniocentesis	2.0	1.7	1.5	1.2
Induced labor	32.1	29.4	26.5	23.2
Tocolysis	2.2	2.2	2.5	3.1
C-section	35.6	26.5	20.3	15.7
Total births	74,661	81,597	186,997	20,570

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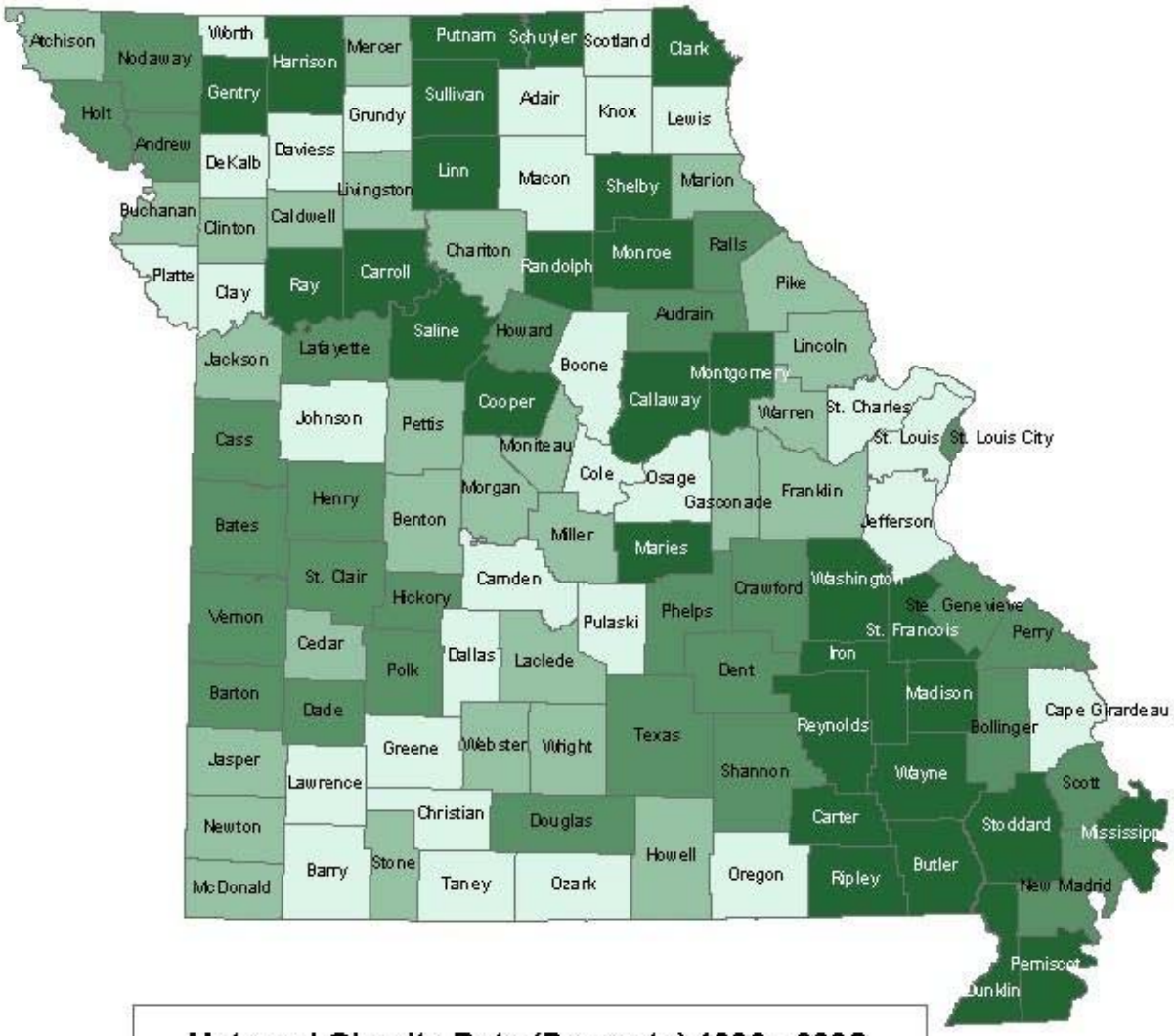
Maternal Obesity Rates by County: Missouri Live Births 1999 - 2003



Maternal Obesity Rate (Percents) 1999 - 2003

- 15.9 - 20.5
- 20.6 - 22.0
- 22.1 - 24.1
- 24.2 - 29.4

Note: Maternal obesity is defined as body mass index of 30 or more using mother's pre-pregnancy weight and height

Table 4
Odds Ratios of Obesity and Overweight vs. Normal Weight Status on Selected Pregnancy Outcomes: Missouri Singleton Pregancies 1999-2003

	Obesity vs. Normal			*Overweight vs. Normal*		
Outcome	*Odds Ratio*	*95 percent confidence interval*		*Odds Ratio*	*95 percent confidence interval*	
Very low birth weight(<1500 grams)	1.23	1.15	1.32	0.97	0.90	1.04
Low birth weight (<2500 grams)	0.88	0.85	0.91	0.82	0.79	0.85
Macrosomia (>4499 grams)	2.52	2.36	2.69	1.77	1.66	1.90
Small-for gestation(SGA)	0.79	0.77	0.82	0.82	0.79	0.84
Early preterm (<32 weeks)	1.09	1.03	1.16	0.93	0.88	0.99
Preterm (<37 weeks gestation)	0.98	0.95	1.00	0.94	0.91	0.96
Congenital anomalies	1.17	1.09	1.25	0.82	0.79	0.84
Fetal Death	1.30	1.17	1.45	1.01	0.90	1.13
Neonatal (<28 days) death	1.31	1.15	1.51	0.96	0.82	1.11
Post-neonatal (1-11 months) death	1.17	0.97	1.42	1.13	0.93	1.36
Perinatal (fetal or neonatal) death	1.31	1.20	1.43	1.00	0.92	1.10
Infant (<1 year) death	1.26	1.13	1.42	1.02	0.91	1.15
Fetal or infant death	1.29	1.19	1.39	1.03	0.95	1.12

Note: Odds ratios calculated using multivariate logistic regression with the following covariates: race,education, age, marital status and smoking status of mother and birth order.

difference between obese and normal categories was not as sharp as for diabetes and hypertension, but was still significant. Among the labor and delivery categories significantly higher among obese women were meconium aspiration, dysfunctional labor, breech and other malpresentation, cephalopelvic disproportion and fetal distress. These conditions also contributed to a considerably higher C-Section rate among obese women (35.6 percent compared to 20.3 percent for normal weight women). Induced labor was also more frequent (32.1 percent of obese births compared to 26.5 percent for normal maternal weight births). Once again, overweight women had C-Section and induced labor rates between obese and normal weight women.

Table 4 shows adjusted relative risks odds ratios (ORs) for selected birth weight, gestational age and perinatal and infant death categories for obese and overweight women, with the normal weight status group as the referent group. Only singleton births were used in this analysis. Generally, obese mothers had higher birth weight babies than normal mothers, by about 105 grams per baby (3,411 grams for obese mothers' babies vs. 3,304 grams for babies of normal weight mothers). Infants of obese mothers were less likely to be low birth weight (LBW, <2,500 grams) than infants of normal weight mothers (OR=0.88) and to be small-for-gestational age (SGA), OR=0.79. However, for very low birth weight (VLBW, <1,500 grams), which frequently leads to premature death, obese mothers' infants had a significantly elevated rate (OR=1.23). Obese mothers were much more likely to have a macrosomic (> 4,499 grams, OR=2.52) baby. Overweight mothers were also more likely than normal weight mothers to have macrosomic babies (OR=1.77).

The overall averages of gestational age were about the same between for obese, overweight and normal weight status categories, 38.7 weeks. Thus for specific short gestational ages there was also little difference between categories, although there was a slight elevation among obese pregnancies of (OR=1.09) for early preterm (<32 weeks) deliveries.

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According to birth certificates, obese mothers had infants with a significantly increased OR for congenital anomalies or birth defects of 1.17 compared with infants of normal weight mothers. While birth certificates usually under-report birth defects, the results are consistent with a Centers for Disease Control and Prevention article by Watkins et al,[3] which showed increased obesity risks for spinal bifida, omphalocele, heart defects and multiple anomalies.

For all perinatal and infant death categories, pregnancies of obese mothers were more likely to end in death than pregnancies of normal weight women. The ORs were statistically significantly elevated for all death categories except post-neonatal (death at ages 1-11 months), where the adjusted OR was 1.17. For all other death categories, the OR of obese to normal weight risk was about 1.3. There was no elevation in the death ORs for overweight women.

In summary, the increasing obesity that has taken place in all of American society has also been reflected among pregnant mothers as obesity has tripled in the last 20 years based on Missouri pre-pregnant weight status. For 1999-2003 Missouri births, obesity was associated with higher rates of hypertension, diabetes, complications of labor and delivery as well as elevated rates of C-Sections and induced labor. Obesity was also associated with elevated rates of birth defects, and perinatal and infant death.

Preventing obesity by adopting physical activity and nutritional habits that promote good health is important for women anticipating pregnancy as well as the general population. A previous Missouri study [4] showed that excessive weight gain (>45 pounds) in one pregnancy can lead to obesity in the next pregnancy and that could be one aspect of prevention.

Preventing obesity is a high priority of the Missouri Department of Health and Senior Services. A comprehensive plan to address the issue is being developed with statewide partners and will be available on the Department website by the beginning of 2005 and can be found at www.dhss.mo.gov.

References:

1. *U. S. Department of Health and Human Services*. The Surgeon General's call to action to prevent and decrease overweight and obesity. Rockville, MD Public Health Service, Office of the Surgeon General (2001). Available at www.surgeongeneral.gov/topics/obesity/calltoaction/foreward.htm.
2. *U. S. Department of Health and Human Services*. Overweight and Obesity: Health consequences. Available at www.surgeongeneral.gov/topics/obesity/calltoaction/fact_consequences.htm.
3. Watkins ML, Rasmussen SA, Honein Ma and Moore CA. Maternal obesity and risk for birth defects. *Pediatrics* Vol. 111 No. 5 May 2003, pp1152-1158.
4. Missouri Monthly Vital Statistics. Maternal Weight Change Between First & Second Pregnancies and Outcomes. September 2002 Vol. 36 No. 7. Available at www.dhss.mo.gov/MonthlyVitalStatistics/sept2002.pdf